Programmes After Market Services (PAMS)
Technical Documentation

DESKTOP CHARGER
CHH–2

AMENDMENT RECORD SHEET

Amendment Number	Date	Inserted By	Comments

Desktop Charger CHH–2

Contents

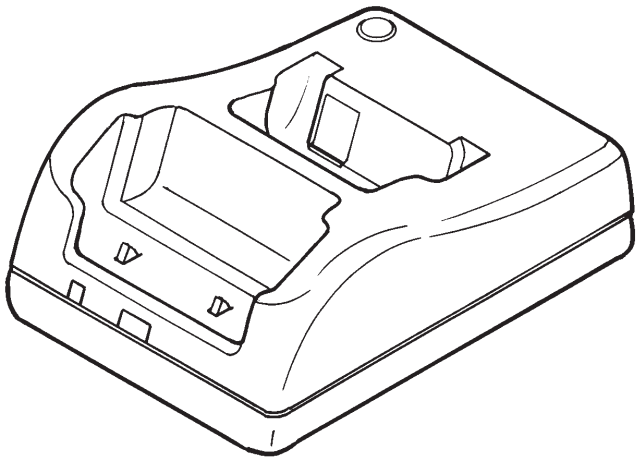
Desktop Charger CHH–2 4
General 4
Technical Summary 4
Operation 4
Charging Indication 5
Technical Specifications 5
Charge States and Charge Control 5
External Signals and Connections 6
Circuit Description 7
Control Logic 7
Prosessor Input/Output Signals 7
Processor A/D Inputs 7
Charging the Spare Battery 8
Discharging the Spare Battery 8
Watchdog Circuit 9
Block Diagram 10
Circuit Diagram 11
Layout and Foil Diagrams 12
Parts List Code: 0200184 13
Exploded View 16
Assembly Parts 16

Desktop Charger CHH–2

Related Documentation

General

The CHH–2 desktop charger is designed for the charging of the handportable phone and a spare battery. In a standard configuration rapid charging is possible by connecting the desktop charger to an ac power outlet via a suitable constant current ac adapter (ACH–4). This must be connected to the d.c. connector, X130.



Technical Summary

Operation

The device has a d.c. plug input connector for ACH–4 charger and 2– and 4–pin output connectors for the phone and extra battery. Charging takes place at a battery temperatures of 5...45 Centigrade. Charge control of the phone is done with phone microprocessor and charge control of extra battery is done with separate microprocessor located in a desktop stand. Phone is always charged first, then extra battery.

A battery gives better capacity if it is occasionally discharged completely. User can do this by using the ‘deep discharge‘ –feature of CHH–2. This feature is provided only extra battery slot and pressing the ‘discharge‘ –button. The extra-battery will then automatically be discharged and charged to full. If this button is pressed twice then the discharge function is cancelled.

Charging Indication

Charge is indicated with two dual–colors led‘s, one for the phone and one for the extra battery pack. The liquid–crystal display of the phone also contains a three–bar battery display.

Led‘s are dim when there is no phone or extra battery connected.

Right led for handportable:

Red phone led indicates a fast charge mode of the phone battery.

Green phone led indicates a tricle (maintenance) charge mode of the phone battery; with steady lcd battery display it means that the battery is full. If the led is green but the battery display is scrolling, charging is disabled due to battery temperature (less than +5 or more than +45 Centigrade).

Left led for spare battery:

Red spare battery led indicates that the battery is not full; either there is a fast charge mode active or charging is disabled due to a battery temperature or to fast charge mode of the phone.

Green spare battery led indicates that the battery is full.

Flashing red spare battery led indicates that a discharge cycle is activated.

Technical Specifications

Charge States and Charge Control

Charge current for the phone is supplied through a series switch transistor in the phone. When this transistor is on the charger is supplying a constant current to the phone. This is the rapid charge mode.

When the transistor is off no current is supplied to the phone and the charger is in the constant voltage mode.

Having been charged up in the rapid charge mode, the battery is kept in full charge using pulsed charging, i.e. switching power alternately on and off at a variable duty cycle and a frequency of a few Hz.

The desktop charger is also provided with control logic for spare battery charging, which is allowed when no phone is connected or when the phone is in the pulsed charge mode.

External Signals and Connections

The charger has three external connectors, the AC fast travel charger connector, the phone charging connector and the spare battery connector.

Fast Travel Charger Connector X130

Pin:	Name:	Description:
1	VDC	Supply voltage input
2	GND	Common ground

Phone Charging Connectors X110, X111

Pin:	Name:	Description:
X110	VC	Charge voltage output
X111	PDET/GND	Charge detect/phone common ground

Spare Battery Connector X120

Pin/X120:	Pin/out:	Name:	Description:
6, 7, 8	1	VBAT	Positive terminal of battery
5	2	BSI	Battery size indicator
4	3	BTEMP	Battery temperature sensing input
1, 2, 3	4	GND	Common ground

Circuit Description

The DC2 desktop charger module consists of microcomputer based control logic for spare battery charging and discharging. It also has power outlet for transportable phone.

Control Logic

Charging is controlled by processor D150. It is a single–chip type controller incorporating RAM, ROM, A/D converter, and a multifunction timer/counter.

Prosessor Input/Output Signals

Name:	Function:
PA0	Phone LED control, green: ”1”
PA1	Phone LED control, red: ”1”
PA2	Spare battery LED control, green: ”1”
PA3	Spare battery LED control, red: ”1”
PA4/DBIN	Discharge button input, ”0”: start discharge
PA5/DISW	Discharge control output, ”1”: discharge enabled
PA6/BSW	Spare battery charge control, ”0”: charge disabled, ”1”: rapid charge, PWM: pulsed mode
PC7	Watchdog reset output

Processor A/D Inputs

Name:	Function:
AN0/VBATL	Battery voltage • range: 0...11 V • resolution: 43 mV/bit
AN1/VBATH	High resolution battery voltage • range 7...11 V • resolution: 16 mV/bit
AN2/PDET	Phone current detect • PDET = ”1” for A/D value higher than 5 • PDET = ”0” for A/D value 5 of or less
AN3/BTEMP	Battery temperature, 27 kΩ pull–up resistor to +5 V reference voltage
AN4/BSI	Battery size, 100 kΩ pull–up resistor to +5 V reference voltage

AN5/CHVOL	Charger voltage detection
AN7/LIREF	Lithium reference voltage input • range: 0...5 V • resolution: 19.5 mV/bit

Charging the Spare Battery

Charging current for the spare battery is fed in via switching transistor V130 and Schottky diode V131. The transistor is controlled by the processor (BSW line). When the transistor is on, a constant current is supplied to the battery. This is the rapid charging mode. In the pulsed charging mode, charging current is adjusted by pulsing this rapid charge current.

Battery voltage is measured through resistor divider R143/R144 (100/121 kohm). The range measured is 0 to 11 V; a voltage variation of 43 mV can be detected. For improved resolution, i.e. rapid charge cut off, operational amplifier N140 is added. This amplifies the battery voltage by a factor of (1 + 100 kohm/56 kΩ) and compares the result to a +5 V reference supply. The A/D converter receives a battery voltage range of 7.0 to 11 V; a better resolution of 16 mV results.

Battery size is determined by reading the BSI line state. This is pulled to +5 V reference voltage by R147 (100 kΩ). In the battery pack a ”size” resistor is connected between BSI and GND.

Temperature is measured over the BTEMP line. This line is pulled to +5 V reference voltage by R145 (27 kΩ). In the battery pack an NTC resistor is connected between BTEMP and GND.

Because the phone and the spare battery cannot be charged at the same time the charging current of the phone must be detected. This is done at the A/D input AN2 (PDET). The charging current for the phone is directed through series diode V114. If the voltage drop across the diode is higher than 100 mV (corresponds to A/D value of 5), charging current is flowing to the phone.

The CHH–2 desktop charger has two dual–colour LEDs to indicate the charging states of the phone and the spare battery.

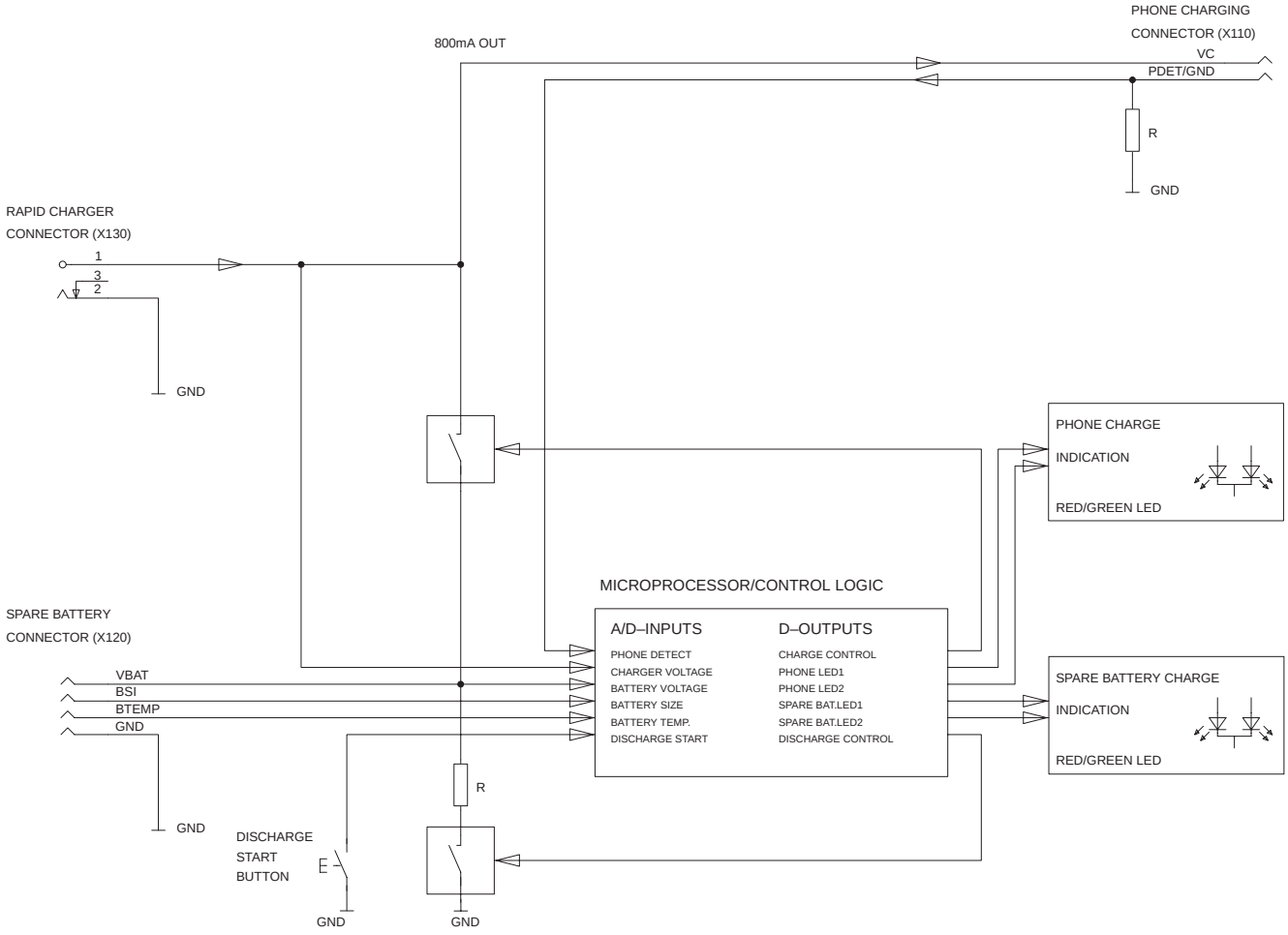
Discharging the Spare Battery

The desktop charger is also provided with a discharge function. This is activated by pressing a discharge switch on top of the charger. The spare battery is then discharged before charging. Resistors R181–R188 determines the discharge current which is fed through switching transistor V134 controlled by processor over the DISW line (pin 64). The battery is discharged to 5 V and thereafter charged normally. The state of the discharge switch is read via the DBIN line (pin 63).

Watchdog Circuit

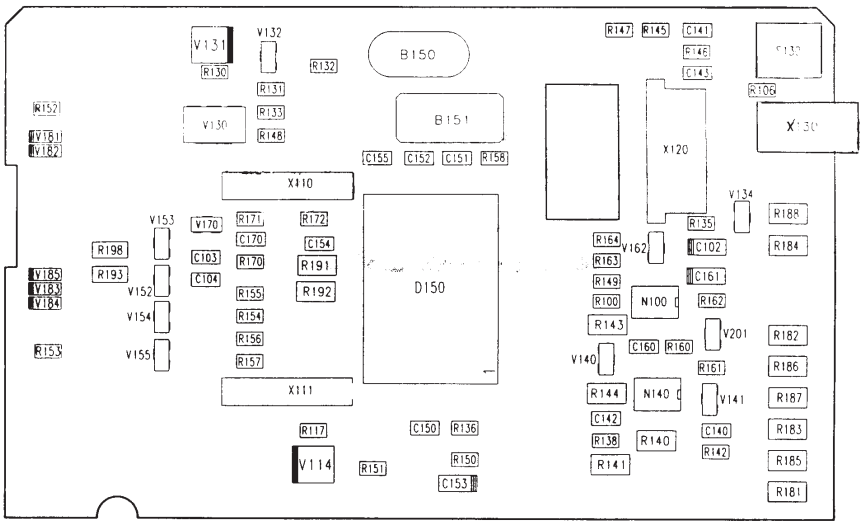
The processor generates positive pulses to output PC7 (pin 18). These pulses are received by transistor V201 discharging capacitor C161. The capacitor is charged through resistor R163. This voltage is fed to regulator N100 shutdown input (pin 3) through transistor V162.The 5V reference supply is generated by regulator N100.If the processor stops the voltage across the capacitor increases and the regulator is switched off.

Block Diagram



Circuit Diagram

Layout and Foil Diagrams



Parts List

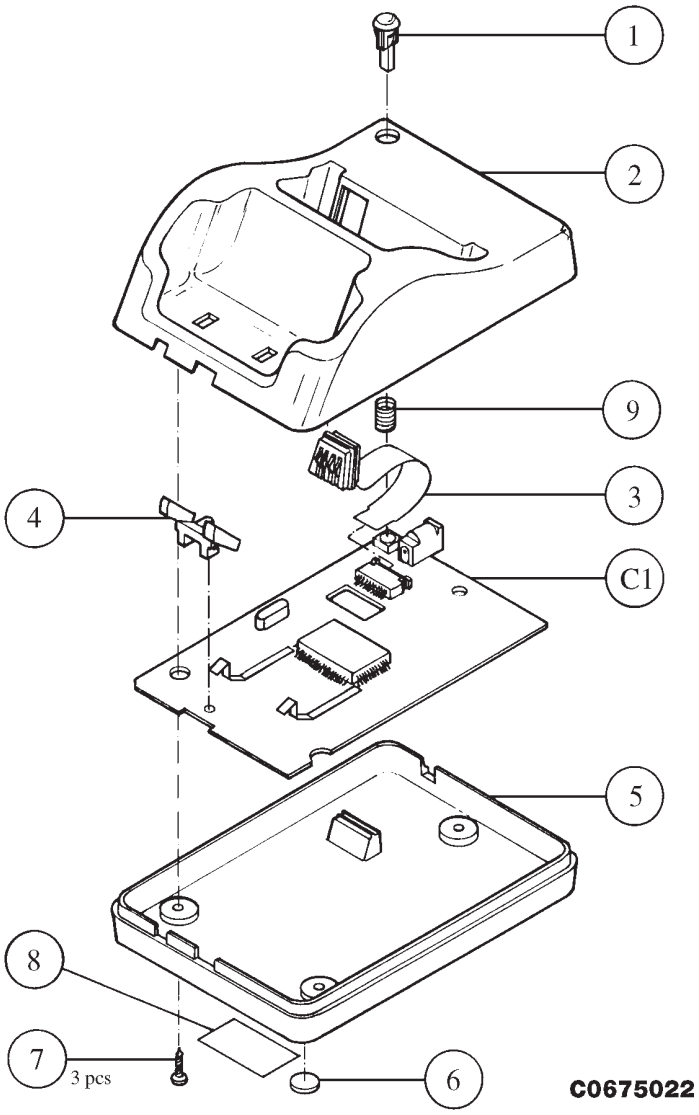
Code: 0200184

ITEM	CODE	DESCRIPTION	VALUE	TYPE
R100	1413603	Chip resistor	47 k	5 % 0.063 W 0805
R106	1412286	Jumper		0805
R107	1411669	Chip resistor	22	5 % 0.063 W 0805
R108	1411669	Chip resistor	22	5 % 0.063 W 0805
R109	1415872	Melf resistor	120	1 % 0.2 W 0204
R110	1415872	Melf resistor	120	1 % 0.2 W 0204
R111	1430073	Chip resistor	27 k	5 % 0.063 W 0603
R117	1413829	Chip resistor	10	5 % 0.063 W 0805
R130	1413603	Chip resistor	47 k	5 % 0.063 W 0805
R131	1412310	Chip resistor	470	5 % 0.063 W 0805
R132	1414029	Chip resistor	3.3 k	5 % 0.063 W 0805
R133	1412310	Chip resistor	470	5 % 0.063 W 0805
R134	1412310	Chip resistor	470	5 % 0.063 W 0805
R135	1412430	Chip resistor	10 k	5 % 0.063 W 0805
R136	1413603	Chip resistor	47 k	5 % 0.063 W 0805
R138	1413603	Chip resistor	47 k	5 % 0.063 W 0805
R140	1416160	Melf resistor	100 k	1 % 0.2 W 0204
R141	1416040	Melf resistor	56.2 k	1 % 0.2 W 0204
R142	1413603	Chip resistor	47 k	5 % 0.063 W 0805
R143	1416160	Melf resistor	100 k	1 % 0.2 W 0204
R144	1416202	Melf resistor	121 k	1 % 0.2 W 0204
R145	1412609	Chip resistor	27 k	5 % 0.063 W 0805
R146	1413603	Chip resistor	47 k	5 % 0.063 W 0805
R147	1413635	Chip resistor	100 k	5 % 0.063 W 0805
R148	1413603	Chip resistor	47 k	5 % 0.063 W 0805
R149	1414029	Chip resistor	3.3 k	5 % 0.063 W 0805
R150	1414029	Chip resistor	3.3 k	5 % 0.063 W 0805
R151	1413635	Chip resistor	100 k	5 % 0.063 W 0805
R152	1413924	Chip resistor	220	5 % 0.063 W 0805
R153	1413924	Chip resistor	220	5 % 0.063 W 0805
R154	1414029	Chip resistor	3.3 k	5 % 0.063 W 0805
R155	1414029	Chip resistor	3.3 k	5 % 0.063 W 0805
R156	1414029	Chip resistor	3.3 k	5 % 0.063 W 0805
R157	1414029	Chip resistor	3.3 k	5 % 0.063 W 0805
R158	1412729	Chip resistor	33 k	5 % 0.063 W 0805
R160	1413603	Chip resistor	47 k	5 % 0.063 W 0805
R161	1412430	Chip resistor	10 k	5 % 0.063 W 0805
R162	1413924	Chip resistor	220	5 % 0.063 W 0805
R163	1414244	Chip resistor	2.2 M	5 % 0.063 W 0805
R164	1414244	Chip resistor	2.2 M	5 % 0.063 W 0805
R170	1414533	Chip resistor	56 k	1 % 0.063 W 0805
R171	1414477	Chip resistor	12.0 k	1 % 0.063 W 0805
R172	1413603	Chip resistor	47 k	5 % 0.063 W 0805

R181	1415576	Melf resistor	301	1 % 0.2 W 0204
R182	1415576	Melf resistor	301	1 % 0.2 W 0204
R183	1415576	Melf resistor	301	1 % 0.2 W 0204
R184	1415576	Melf resistor	301	1 % 0.2 W 0204
R185	1415576	Melf resistor	301	1 % 0.2 W 0204
R186	1415576	Melf resistor	301	1 % 0.2 W 0204
R187	1415576	Melf resistor	301	1 % 0.2 W 0204
R188	1415576	Melf resistor	301	1 % 0.2 W 0204
R191	1416107	Melf resistor	5.62 k	1 % 0.2 W 0204
R192	1416040	Melf resistor	56.2 k	1 % 0.2 W 0204
R193	1411490	Chip resistor	100	5 % 0.12 W 1206
R198	1411490	Chip resistor	100	5 % 0.12 W 1206
C102	2604209	Tantalum cap.	1.0 µ	20 % 16 V 3.2x1.6x1.8
C103	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C104	2308697	Ceramic cap.	47 n	20 % 50 V rad 2M
C105	2604110	Tantalum cap.	10 µ	20 % 25 V 7.3x4.4x2.8
C129	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C130	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C131	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C132	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C133	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C134	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C135	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C136	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C137	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C140	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C141	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C142	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C143	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C150	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C151	2310343	Ceramic cap.	22 p	5 % 50 V 0805
C152	2310343	Ceramic cap.	22 p	5 % 50 V 0805
C153	2604209	Tantalum cap.	1.0 µ	20 % 16 V 3.2x1.6x1.8
C154	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C155	2310738	Ceramic cap.	4.7 n	20 % 50 V 0805
C160	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C161	2604209	Tantalum cap.	1.0 µ	20 % 16 V 3.2x1.6x1.8
C170	2307816	Ceramic cap.	47 n	20 % 25 V 0805
B150	4500822	Crystal	11.0592 M	CL30PF H=3.6 mm
V114	4110074	Schottky diode	STPS340U	40 V 3 A SOD6
V129	4110074	Schottky diode	STPS340U	40 V 3 A SOD6
V130	4210020	Transistor	BCP69–25	pnp 20 V SOT223
V131	4110074	Schottky diode	STPS340U	40 V 3 A SOD6
V132	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V134	4200226	Darl. transistor	BCV27	npn 30 V 300 mA SOT23
V140	4100567	Sch. diode x 2	BAS70–04	70V15 mA SERSOT23
V141	4106992	Zener diode	BZX84	5 % 8.2 V 0.3 W SOT23
V152	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23

V153	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V154	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V155	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V162	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V170	4100567	Sch. diode x 2	BAS70–04	70 V 15 mA SERSOT23
V181	4864378	Led	Green	2.2 V 0805
V182	4864380	Led	Red	0805
V183	4864378	Led	Green	2.2 V 0805
V184	4864380	Led	Red	0805
V185	4864380	Led	Red	0805
V201	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
D150	4340034	IC, RAM	MCU16/8	QFP64
N100	4301062	IC, regulator	LP2951AC	SO8S
N140	4309576	IC, 2 x op.amp.	TLC27M2I	SO8
S130	5200914	Push button switch 2–pole 6x7		smd
X120	5431702	Flexfoil connect 1x08 1 mm		smd
X130	5407088	DC connector d=4.5/3.8		
	9560020	Conn.spring		4D22980 CHH–2
	9853917	PC board	DC2	91.5x56.3x1.6 d 4/pa

Exploded View



Assembly Parts

ITEM	Q'TY	CODE	DESCRIPTION	VALUE, TYPE
1		9460089	Discharge button	4D 22992
2		9450259	Front cover	1D 22990
3		5461000	Battery connector	1x04
4		9460088	Light guide	3D 22993
5		9450260	Bottom cover	1D 22991
6	4	6501067	Adhesive foot	d=8.0 h=2.0
7	3	6293012	PT screw	KB22x8 FeZn
8		9380154	Label blank	4D 22419
C1		0200184	Charging module DC2	

This page intentionally left blank.